National Institute of Environmental Health Sciences

Future extreme events in European climate: An exploration of regional climate model projections

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Abstract:

This paper presents an overview of changes in the extreme events that are most likely to affect Europe in forthcoming decades. A variety of diagnostic methods are used to determine how heat waves, heavy precipitation, drought, wind storms, and storm surges change between present (1961–90) and future (2071–2100) climate on the basis of regional climate model simulations produced by the PRUDENCE project. A summary of the main results follows. Heat waves – Regional surface warming causes the frequency, intensity and duration of heat waves to increase over Europe. By the end of the twenty first century, countries in central Europe will experience the same number of hot days as are currently experienced in southern Europe. The intensity of extreme temperatures increases more rapidly than the intensity of more moderate temperatures over the continental interior due to increases in temperature variability. Precipitation – Heavy winter precipitation increases in central and northern Europe and decreases in the south; heavy summer precipitation increases in north-eastern Europe and decreases in the south. Mediterranean droughts start earlier in the year and last longer.Winter storms – Extreme wind speeds increase between 45°N and 55°N, except over and south of the Alps, and become more north-westerly than cuurently. These changes are associated with reductions in mean sea-level pressure, leading to more North Sea storms and a corresponding increase in storm surges along coastal regions of Holland, Germany and Denmark, in particular. These results are found to depend to different degrees on model formulation. While the responses of heat waves are robust to model formulation, the magnitudes of changes in precipitation and wind speed are sensitive to the choice of regional model, and the detailed patterns of these changes are sensitive to the choice of the driving global model. In the case of precipitation, variation between models can exceed both internal variability and variability between different emissions scenarios.

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Resource Description

Climate Scenario :

specification of climate scenario (set of assumptions about future states related to climate)

Special Report on Emissions Scenarios (SRES)

Special Report on Emissions Scenarios (SRES) Scenario: SRES A2, SRES B2

Communication:

resource focus on research or methods on how to communicate or frame issues on climate change; surveys of attitudes, knowledge, beliefs about climate change

A focus of content

Communication Audience:

audience to whom the resource is directed

Policymaker

Exposure :

weather or climate related pathway by which climate change affects health

Extreme Weather Event, Precipitation, Temperature

Extreme Weather Event: Drought, Other Extreme Event

Extreme Weather Event (other): Wind storms

Temperature: Extreme Heat

Geographic Feature:

resource focuses on specific type of geography

None or Unspecified

Geographic Location:

resource focuses on specific location

Non-United States

Non-United States: Europe

Health Impact:

specification of health effect or disease related to climate change exposure

Injury

Mitigation/Adaptation:

mitigation or adaptation strategy is a focus of resource

Adaptation

Model/Methodology:

type of model used or methodology development is a focus of resource

Exposure Change Prediction

Resource Type:

format or standard characteristic of resource

Research Article

Timescale: ☒

time period studied

Long-Term (>50 years)

Vulnerability/Impact Assessment: ☒

resource focus on process of identifying, quantifying, and prioritizing vulnerabilities in a system

A focus of content